DEPARTMENT OF MECHANICAL ENGINEERING

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	**B.Tech – Mechanical Engineering**		
Course Title	**Composite Materials**		
Course Code	**MEOE12**	**No. of Credits**	**3**
Course Code of Pre-requisite subject(s)			
Session	**Jan 2022**	**Section (if, applicable)**	
Name of Faculty	**Dr. R. Prakash**	**Department**	**Mechanical Engg.**
Email	**rprakash@nitt.edu**	**Telephone No.**	**9444810545**
Name of Course Coordinator(s) (if, applicable)			
E-mail		**Telephone No.**	
Course Type	☐ **Core course** ☑ **Elective course**		

Syllabus (approved in BoS)

Classification and characteristics of composite materials - Types of fiber and resin materials, functions and their properties – Application of composite to aircraft structures-Micromechanics-Mechanics of materials, Elasticity approaches-Mass and volume fraction of fibers and resins-Effect of voids, Effect of temperature and moisture.

Hooke's law for orthotropic and anisotropic materials-Lamina stress-strain relations referred to natural axes and arbitrary axes.

Governing equations for anisotropic and orthotropic plates- Angle-ply and cross ply laminates-Analysis for simpler cases of composite plates and beams - Interlaminar stresses.

Manufacture of glass, boron and carbon fibers-Manufacture of FRP components- Open mould and closed mould processes. Properties and functions of resins.

Netting analysis- Failure Criteria-Flexural rigidity of Sandwich beams and plates – composite repair- AE technique.

COURSE OBJECTIVES

1. To impart knowledge on the composite materials properties.
2. To study the stress-strain behavior of different composite materials.
3. To analyze the mechanics of different ply laminates.
4. To impart knowledge on the various manufacturing process of FRP components.
5. To evaluate the different failure criteria for composite materials.

COURSE OUTCOMES (CO)

Course Outcomes	**Aligned Programme Outcomes (PO)**
At the end of the course student will be able to	
1. Examine the characteristics of composite materials	**1-3,7,10,12**
2. Sketch the stress-strain behavior of various composites materials.	**1-3,5,7,10,12**
3. Design the different lamina layup sequence based on the requirements.	**1-3,5,7,10,12**
4. Choose the suitable manufacturing process of FRP components.	**1-3,7,10,12**
5. Apply the appropriate the failure criteria for composite laminates.	**1-3,5,7,10,12**

COURSE PLAN – PART II			
COURSE OVERVIEW			
This course provides characteristics, mechanics and manufacturing methods of composites materials.			
COURSE TEACHING AND LEARNING ACTIVITIES			
S. No.	**Week/Contact Hours**	**Topic**	**Mode of Delivery**
1	1st Week	Classification and characteristics of composite materials - Types of fiber and resin materials, functions and their properties, Application of composite to aircraft structures	Online mode - PPT & by writing pad
2	2nd Week	Mechanics of materials, Elasticity approaches	Online mode - PPT & by writing pad
3	3rd Week	Mass and volume fraction of fibers and resins-Effect of voids, Effect of temperature and moisture.	Online mode - PPT & by writing pad
4	4th Week	Hooke's law for orthotropic and anisotropic materials	Online mode - PPT & by writing pad
5	5th Week	Lamina stress-strain relations referred to natural axes and arbitrary axes	Online mode - PPT & by writing pad
6	6th Week	Governing equations for anisotropic and orthotropic plates	Online mode - PPT & by writing pad
7	7th Week	Angle-ply and cross ply laminates	Online mode - PPT & by writing pad
8.	8th Week	Analysis for simpler cases of composite plates and beams - Interlaminar stresses	Online mode - PPT & by writing pad
9.	9th Week	Manufacture of glass, boron and carbon fibers	Online mode - PPT & by writing pad
10.	10th Week	Manufacture of FRP components	Online mode - PPT & by writing pad
11.	11th Week	Open mould and closed mould processes, Properties and functions of resins	Online mode - PPT & by writing pad
12.	12th Week	Netting analysis- Failure Criteria-Flexural rigidity of Sandwich beams and plates	Online mode - PPT & by writing pad
13.	13th Week	Composite repair- AE technique	Online mode - PPT & by writing pad

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle Test 1	As decided by CC	1 hr 30 min	25
2	Cycle Test 2	As decided by CC	1 hr 30 min	25
3	Quizzes/ Assignments	Through Semester	Varying	20
CPA	Compensation Assessment*	As decided by CC	1 hr 30 min (syllabus – upto last week class teaching)	25
4	Final Assessment *	As per the academic calendar	2 hrs	30

***mandatory; refer to guidelines on page 4**

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

1. Feedback from the students during class committee meeting.
2. At the end of every cycle test, feedback will be obtained for the lecture improvement
3. End semester feedback on Course Outcomes.

COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)

MODE OF CORRESPONDENCE (email/ phone etc)

1. Per Email (rprakash@nitt.edu) only, NO MOBILE PHONE communications.
2. Student meeting hours: Monday to Thursday 16:00 – 19:00
   (during this time period, students can come and discuss their doubts, projects, and assignment works)
3. Strictly not by phone after the working hours (09:00 – 19:00)

COMPENSATION ASSESSMENT POLICY

Whomever missed the cycle test 1 or 2, can compensate with extra exam. Syllabus for the test should be the topics covered up to last week before the test.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- **At least 75% attendance in each course is mandatory.**
- **A maximum of 10% shall be allowed under On Duty (OD) category.**
- Students with **less than 65% of attendance** shall be prevented from writing the final assessment and **shall be awarded 'V' grade.**

ACADEMIC DISHONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

  The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION

Course materials can be obtained from MS Teams/MEOE12 Composite Materials

FOR APPROVAL

Course Faculty 24/01/2022 **CC-Chairperson** 24-01-2022 **HOD** 24/01/2022

Guidelines:

a) The number of assessments for a course shall range from 4 to 5.

b) Every course shall have a final assessment on the entire syllabus with at least 30% weightage.

c) One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.

d) The passing minimum shall be as per the regulations.

B.Tech. Admitted in				P.G
2018	2017	2016	2015	
35% or class average/2 whichever is greater.		Peak/3 or class average/2 whichever is lower		40%

a) **Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.**

b) **Absolute grading policy shall be incorporated if the number of students per course is less than 10.**

c) **Necessary care shall be taken to ensure that the course plan is reasonable and is objective.**